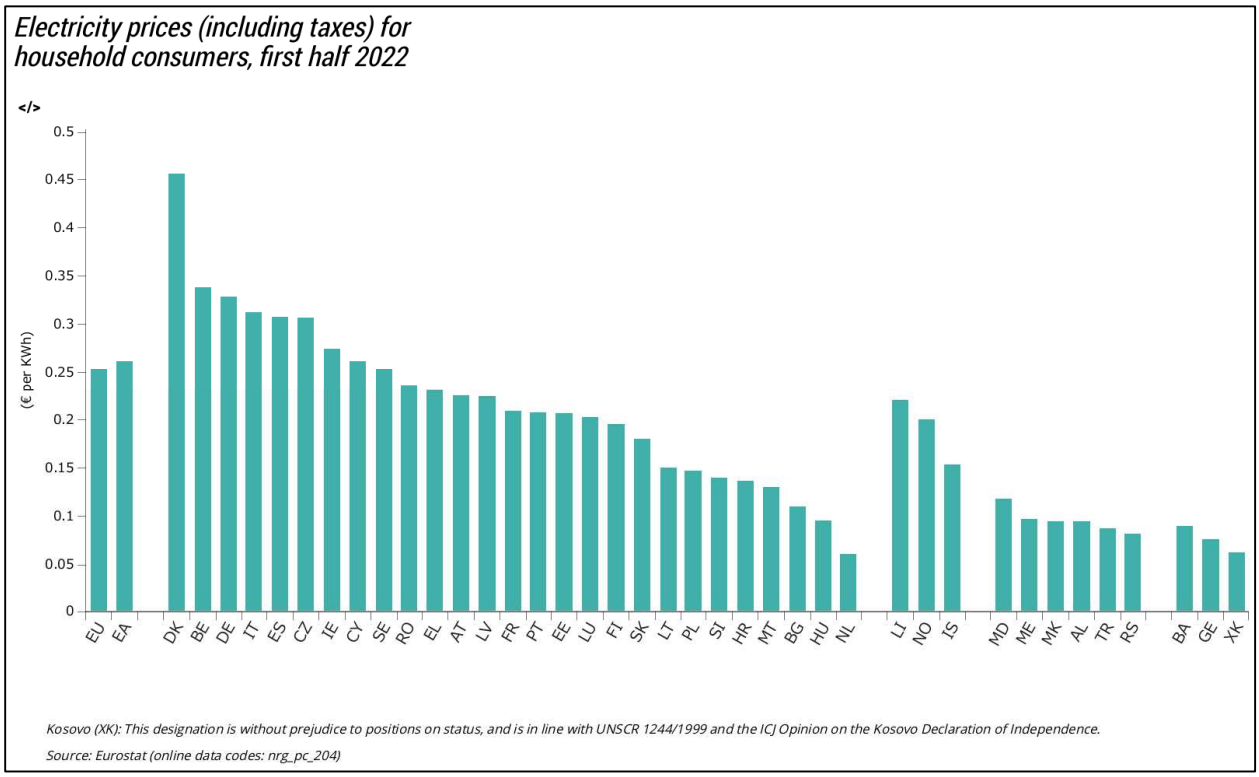
IS DENMARK REALLY A GREEN PARAGON?



Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics

The global quest for decarbonization of the energy supply has created a number of interim successes that are widely portrayed as examples to follow. Denmark is one of them. Taking advantage of the prevailing North Atlantic westerlies, the country's onshore and offshore wind turbines now generate 48% of its electricity, some of the abundant production of Danish straw is used for both electricity generation and for urban district heating, and despite its small size it is EU's fourth largest producer of biomethane (used mostly for electricity generation) from agricultural wastes (13.4 million pigs, more than two for every Dane).

The result: even when taking into account Denmark's relatively significant methane releases (from about 1.5 million heads of cattle, roughly one for every four Danes), the country's per capita greenhouse gas emissions (in terms of CO_2 equivalent) were cut by nearly half between 2000 and 2020 (from 13.8 to 7.3 tons). In comparison, Germany, despite the two decades of its expensive *Energiewende* achieved only about a 30% cut, the EU as a whole reduced its emissions by about 24%, US emissions declined by about 12% and China's generation of greenhouse gases has nearly tripled.

Denmark clearly looks like a great decarbonization story -- but a closer look shows that it cannot be a widely replicable example of success. Denmark's rising wind-driven generation has been accompanied by a fairly steady increase of electricity imports: they had nearly doubled between 2010 and 2021 (from 10.6 to 20.1 TWh) and as exports have equaled roughly two-thirds of that total the country has been a significant net importer of electricity. At about 18% of the total consumption, it was about as dependent on electricity imports as Greece and 50% more dependent than Italy (Germany is a net electricity exporter, France an even large one). Larger economies, and the countries not as well connected to neighboring major hydroelectricity and coal-fired electricity producers (Norway, Sweden, Germany) do not have the option of securing nearly every fifth kWh from imports. Moreover, Denmark now has the EU's most expensive electricity, 45% dearer than the union's average.

Even more importantly, Denmark has always used its large agricultural exports to buy energy-intensive industrial products, and it has done so to a

much higher extent than other Nordic, and many other small EU, countries. Norway, thanks to its inexpensive electricity, is a major producer of aluminum, Sweden and Finland have relatively sizable steel industries, Finland is also a paper-making super-power -- but Denmark does not produce any aluminum and any iron and steel, and it also does not make (despite its intensive crop production) any ammonia, any float glass and, of course, having no forests to speak of, any paper. And, unlike Sweden and Finland (or half a dozen other small EU countries), it does not make or assemble any cars. These are all energy-intensive products, some of them requiring significant inputs of fossil carbon, and importing them transfers the emissions associated with their production to exporting countries: it is easier to be green when letting others to do black tasks!

This reality shows clearly in Denmark's overall economic complexity, the measure that captures the diversity of exports and ability to produce a large variety of sophisticated products. At 0.97 its index is far lower not only than in Finland (1.47) and Sweden (1.59) but also in Slovakia, Slovenia, Malaysia or Thailand. Obviously, it is far more likely that more complex economies will be more energy intensive, and, given the continued dominance of fossil fuels in the global energy supply, that they will have higher carbon emissions. This is true no matter if such complex economies are large energy producers (US, China) or large energy importers (Japan, Germany). Undoubtedly, Denmark has done well on many accounts, but the accomplishments and options of a small, uniquely situated and not too complex economy do not provide an admirable

example for countries with the world's largest greenhouse gas emissions (China, US, India) or for the world's most diversified economies (Japan, South Korea).

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(Disclaimer: The views and impressions in the columns are personal opinions of Prof. Smil and do not represent the opinions of ICEF.)